CLAIMS

What is claimed is:

1. An admission control procedure for traffic in a DS-CDMA system comprising the following steps:

a) admitting to the system and activating codes for users with increasing order of signal to noise ratios starting with the lowest signal to noise ratio;

b) determining the power level of all active users and raising the power levels to compensate for the interference caused by the admission of new users; and

c) activating new codes in steps of one while ensuring no active user is power limited.

2. An admission control procedure as set forth in claim 1 wherein the admission control procedure activates the code with the least impact on power levels and interferences.

3. An admission control procedure as set forth in claim 1 wherein the admission control procedure is terminated when at least one user becomes power limited.

4. An admission control procedure as set forth in claim 1 wherein the power levels of active users is reduced as codes leave the system.

5. An admission control procedure as set forth in claim 1 wherein the DS-CDMA system is one of local area network, wide area network, metropolitan area network and a fixed wireless network.

6. A procedure for admission control in a DS-CDMA network comprising the following steps:

a) arranging network users in increasing order based on their bit energy to noise requirements;

b) beginning network admission with a first network user and allocating as many codes as requested and feasible;

c) continuing network admission for each consecutive network user; and

d) testing to see if an additional number of potential codes can be activated simultaneously and if an acceptable overall power allocation exists for each of the potential codes, comprising the sub-step of activating the potential codes if the acceptable overall power allocation exists and the sub-steps of rejecting the potential codes and terminating network admission if the acceptable overall power allocation does not exist.

7. A procedure for admission control as set forth in claim 6 wherein the number of codes allocated to the first network user is limited by power and performance constraints.

8. A procedure for admission control as set forth in claim 6 wherein the number of codes assigned to all network users is limited by power and performance constraints.

9. A procedure for admission control as set forth in claim 6 wherein successively smaller numbers of potential codes are tested for simultaneous activation until an acceptable overall power allocation is found such that the code activation requests corresponding to the smaller numbers of potential codes is accepted.

10. A procedure for admission control as set forth in claim 6 wherein the acceptance of the number of codes terminates the admission process.

11. A procedure for admission control in a DS-CDMA network comprising:

a) considering new potential codes for activation in increments of 1;

b) checking each new code to make certain that there is a feasible power allocation for all active codes and each new potential code; and;

c) admitting the new potential code if the feasible power allocation exists; and rejecting the potential code and terminating the procedure if the feasible power does not exist.

12. A procedure for admission control as set forth in claim 11 wherein the feasible power allocation does not exist if the power that would be required by all active users upon activation of the new code, is greater than a maximum transmission power capability of all users.

13. A procedure for admission control as set forth in claim 12 wherein the feasible power allocation further does not exist if a received bit energy to noise power ratio minimum threshold target is not met for the active codes.

14. A method for implementing potential users on a DS-CDMA network comprising the following steps:

a) relating data rates of all users in terms of powers;

b) separating the users into different power groups and selecting a power group for further processing;

c) classifying the users into different data rate sets;

d) deriving powers of the users in the different sets based on a maximum acceptable in-cell interference for the selected power group;

e) determining data rates of the users from the derived powers; and

f) selecting a different power group and undertaking the classifying, deriving and determining steps to provide various data rate and power allocations.

15. A method for implementing potential users as set forth in claim 14 further comprising the step of picking the allocation that yields the highest sum of data rates for the users.

16. A method for implementing potential users as set forth in claim 14 wherein the different power groups are arbitrarily separated, the separation comprising maximum power limited and maximum power not limited.

17. A method for implementing potential users as set forth in claim 14 wherein the different rate sets comprises a first set of users at a minimum data rate, a second set of users at a maximum data rate, and a third set of users at a data rate between the minimum data rate and the maximum data rate.

18. A method for implementing potential users as set forth in claim 14 wherein the VG-CDMA network is one of local area network, wide area network, metropolitan area network and a fixed wireless network.

19. A method for implementing potential users as set forth in claim 14 wherein said separating step comprises the sub-step of considering the location of the users relative to a nearest reception/transmission cell of the network, placing the users operating at maximum power in view of their distance from the cell in a maximum power group.

20. A method for selecting the optimum power and data rate to be used to maximize the throughput through a DS-CDMA network comprising the following steps:

a) organizing the users into the following sets:

0) users operating at less than the maximum power;

1) users not operating at the maximum data rate or the minimum data rate;

2) users operating at the minimum data rate; and

3) users operating at the maximum data rate;

b) determining the constant coefficients, which relate the powers of the users in sets 2 and 3, to the powers of the users in set 1;

c) determining the powers of all users in set 1 in terms of the power of any single arbitrarily chosen user denoted by i.

c) determining the power of the single user with undetermined power s_i in set 1.

d) determining the power of the remaining users in set 1 and then determining the powers of the users in sets 2 and 3;

e) determining the total interferences generated by the users in the network;

f) determining the optimal power vector using the maximum value of interference;

g) determining the optimal rate allocation for the particular choice of sets; and

h) comparing the rate allocations for all possible combinations of the sets and solving for an optimal rate allocation.

21. A method for selecting the optimum power and data rates as set forth in claim 20 wherein the total in-cell interference in step e) is the sum of the received power of all users.

22. A method for selecting the optimum power and data rate as set forth in claim 20 wherein the power of all users of the network are functions of the total in-cell interference.

23. A method for selecting the optimum power and data rate as set forth in claim 20 wherein the organizing of the users into the first set based on the power being used is an in or out test based on the power levels of the users relative to the maximum received power.

24. A method for selecting the optimum power and data rate as set forth in claim 23 wherein all users having power levels less than the maximum received power are included in the set.

25. A method for selecting the optimum power and data rates as set forth in claim 20 wherein at the optimal power and rate allocation the rates of the interference experienced by any two users is equal to the square root of the reciprocal of their bit energy to noise targets.

26. A method for selecting the power and data rates to be used to substantially maximize the throughput through a DS-CDMA network comprising the following steps:

a) organizing users into the following sets:

0) users having high values of signal to noise ratio;

1) users with high signal to noise ratio requirements;

2) users with lower values of T^{min} *where* $T = \frac{E_b/N_o}{W/r}$;

3) users with lower values of $T^{max.}$

b) determining the constant coefficients, which relate the powers of the users in sets 2 and 3 to the powers of the users in set 1;

c) determining the power of the users in set 1 with the lowest maximum signal to noise ratio;

d) determining the power of the remaining users in set 1 and then sets 2 and 3;

e) determining the total interference of the users on the network;

f) determining the power vector using the value of in-cell interference;

g) determining the rate allocation based on the determined power vector;

h) determining the power and data rate vector for all possible classifications of the users in the different sets.

i) comparing the rate allocations for all possible combinations of the above sets to determine the optimal rate allocation the yields the maximum sum of the data rates.

27. A method for selecting the optimum power and data rate for use in a DS-CDMA network comprising the following steps:

a) organizing network users into sets based on their data rates;

b) determining the constants that relate the powers of the latter set members to the power of the user in the earlier sets;

c) determining the power of the first member of the first set;

d) determining the powers of the remaining members of the first set, and the power of all members of the remaining sets;

e) determining the power vector from the total in-cell interference;

f) determining the rate allocation for the particular choice of sets; and

g) comparing the rate allocations as determined to select the optimal rate allocation.

28. A method for selecting the optimum power and data rates as set forth in claim 27 wherein the transmit powers have to be recalculated when a multi-media user changes data rates to meet a data transmission requirement.

29. A method for selecting the optimum power and data rates as set forth in claim 27 wherein the users are divided into sets based on the use of maximum rate, minimum rate, and a rate between maximum and minimum.

30. A method for selecting the optimum power and data rates as set forth in claim 27 wherein at the optimal power and rate allocation, the ratio of interference experienced by the users is equal to the square root of the reciprocal of their bit energy to noise targets.

31. A DS-CDMA network comprising:

a plurality of users having different bit energy to noise requirements;

a limited number of potential codes available to be used by the users;

a limited overall power allocation available for each of the potential codes; and

an admission protocol, the admission protocol maximizing the capacity utilization within the network with the limited overall power budget.

32. A DS-CDMA network as set forth in claim 31 wherein the admission protocol arranges the networks in increasing order based on the bit energy to noise requirements.

33. A DS-CDMA network as set forth in claim 32 wherein the admission protocol includes testing of multiple potential codes for generally simultaneous activation, the number of multiple potential codes being reduced until an acceptable threshold is met.

34. A DS-CDMA network as set forth in claim 33 wherein the acceptable threshold is limited by the limited overall power allocation such that code failure is minimized for every user within the network.

35. A DS-CDMA network as set forth in claim 31 wherein the admission protocol includes:

a second plurality of the users being at different powers, the users being separated into different power groups;

a third plurality of the users being at different data rates, the users being separated into different data rate sets; and

a maximum in-cell interference being available for the users in each of the different power groups, wherein the allocation process optimizes the different powers and the different data rates to determine the data rate and the power for each user.

36. A DS-CDMA network as set forth in claim 35 wherein the users are placed in at least two different power groups, a first power group being limited in power and a second power group operational at maximum power.

37 A DS-CDMA network as set forth in claim 36 wherein a user at a high power in view of its remote location from a nearest/transmission cell is placed into the second power group.

38. A DS-CDMA network as set forth in claim 35 wherein the different rate sets comprise a first rate set of users at a minimum data rate, a second set of users at a maximum data rate, and a third set of users at a data rate between the minimum data rate and the maximum data rate.